FAA-E-2140a
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SUPERSEDING
FAA-E-2140, 9/11/64

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION SPECIFICATION

GLIDE SLOPE TEST KIT

1. SCOPE

1.1 Scope. - The equipment covered by this specification consists of various transmission line devices and networks, detection elements, terminations, and adapters for use in installation, periodic maintenance, alignment, and fault diagnosis of the ILS Glide Slope Facility, and includes a portable carrying case.

2. APPLICABLE DOCUMENTS

2.1 FAA specifications. - The following FAA specifications, of the issues specified in the invitation for bid or request for proposals, form a part of this specification:

FAA-G-2100/1 Electronic Equipment, General Requirements; Part I, General Requirements for all Equipments

FAA-R-1030 Packing of Electronic Equipment

(Copies of this specification, and of the applicable FAA specifications and drawings, may be obtained from Federal Aviation Administration, Washington, D. C. 20590, ATTN: Contracting Officer. Requests should fully identify material desired, i.e., specification numbers, dates, amendment numbers, complete drawing numbers; also, the request should identify the invitation for bid, request for proposal, or contract involved, or other use to be made of the requested material.)

3. REQUIREMENTS

3.1 Equipment to be furnished by the contractor. - Each equipment furnished by the contractor shall be complete in accordance with all specification requirements and shall include the items and quantities tabulated below. Two instruction pamphlets (3.1.1) shall be furnished for each equipment and shipped therewith.

ITEM	COMPONENT	QUANTITY	PARAGRAPH
1	Variable attenuator	1 ea.	3.8
2	Phase shifter	1 ea.	3.9
3	Wattmeter elements 0.1W, 0.25W, 2.5W, 5W	1 ea.	3.10
4	360 degree cable assembly	1 ea.	3.11
5	360 degree cable assembly	1 ea.	3.12
6	180 degree cable assembly	1 ea.	3.13
7	8 foot cable assembly	1 ea.	3.14
8	274 - QBJ adapter	1 ea.	3.15
9	Carrying case	1 ea.	3.16
10	Instruction pamphlet	2 ea.	3.1.1

3.1.1 Instruction pamphlets. - The instruction pamphlet shall include a general description; electrical characteristics; complete calibration data; manufacturer's part numbers; maintenance instructions; and any descriptive data which, in the opinion of the contractor, would enhance the use of the equipment. The overall dimensions of the pamphlet shall not exceed 9 x 11-1/2 inches. The contractor's commercial instruction pamphlet will be acceptable if it meets the foregoing minimum requirements.

3.2 Definitions.

3.2.1 Normal test conditions. - The term "normal test conditions" is defined as follows:

Ambient temperature $30^{\circ} \pm 10^{\circ}C$

3.3 General functional requirements. - The various items specified herein will provide for the accomplishment of the following measurements and adjustments at a Glide Slope facility:

a. A phase shifter, having an insertion phase of 360 electrical degrees at 332.0 MHz, for adjustment of the relative phase of individual input and output signals.

b. A variable high power attenuator for adjustment of the relative amplitude of two signals without affecting the phase.

c. Wattmeter elements for power and VSWR measurements.

d. An assortment of cables, with known insertion phase, for connecting the various components into the glide slope system without disturbing the system operation or balance. An uncalibrated adapter for interconnection convenience is also provided.

3.4 Frequency range. - The equipment specified herein shall be designed for operation in the frequency band 328.0 to 336.0 MHz. Except where otherwise specified, all requirements shall apply throughout this frequency range.

3.5 Characteristic impedance. - The characteristic impedance of the equipment specified herein shall be 50 ohms.

3.6 Power handling capability. - The equipment specified herein shall be capable of continuous operation with 20 watts sine wave RF power applied, except where otherwise specified.

3.7 Coaxial cable. - All coaxial cable furnished with the equipment shall be MIL type RG-223/U.

3.8 Variable attenuator. - The attenuator shall be continuously variable and cover the range from 1 dB (or lower) to 10 dB. The attenuator dial shall be calibrated in 1.0 dB increments over the insertion loss range of 1.0 to 10.0 dB with an accuracy of $\pm$0.25 dB. Over the full range of attenuation, the VSWR shall not exceed 1.15 over the specified frequency range. Over the full range of attenuation, the insertion phase shall be 360 $\pm$5.0 degrees at 332.0 MHz. Input and output connectors shall be UG-1095 A/U. The attenuator assembly shall be completely self contained with only the dial and connectors protruding beyond the case. This case shall be aluminum and shall be finished as specified in FAA-G-2100/1 except that the brown color is not mandatory.

3.9 Phase shifters. - The phase shifter shall cover the range of $\pm$60 degrees minimum from midscale with 360 $\pm$5.0 degrees insertion phase at the 0 degree (zero) setting at 332.0 MHz. The VSWR shall not exceed 1.05 over the specified frequency range. The input connector shall be Type "N" male and the output connector shall be Type "N" female.

3.10 Wattmeter elements. - The 0.1W, 0.25W, 2.5W, and 5W elements shall be Bird Electronic Corporation (30303 Aurora Road, Solon, Ohio, 44139) Types 0.1G, 0.25G, 2.5G, and 5G, or equal. Accuracy shall be within $\pm$5% of full scale over the frequency range of 310 to 350 MHz when used in conjunction with the Bird Model 43 Thruline Wattmeter. Frequency range and rated wattage shall be shown on the element.

3.11 Cable item 4. - The RF cable shall have an insertion phase of 360 $\pm$5.0 degrees at 332 MHz. Input and output connectors shall be type "N" male. The VSWR shall not exceed 1.05 over the specified frequency range.

3.12 Cable item 5. - The RF cable shall have an insertion phase of 360 $\pm$5.0 degrees at 332.0 MHz. The input connector shall be type "N" male and the output connector shall be type "N" female. The VSWR shall not exceed 1.05 over the specified frequency range.

3.13 Cable item 6. - The RF cable shall have an insertion phase of 180° $\pm 5.0^{\circ}$ at 332.0 MHz. The input connector shall be type "N" male and the output

connector shall be type "N" female. The VSWR shall not exceed 1.05 over the specified frequency range.

3.14 Cable item 7. - This cable assembly shall have an overall length of 8 feet ±1.0 inch. The input connector shall be type "BNC" male and the output connector shall be a standard phone plug type PL-55R(PJ-055), or equal.

3.15 Uncalibrated adapters. - The following type of adapter shall be furnished without calibration:

274-QBJ	General Radio, or equal, Female "BNC" to shielded banana plugs

3.16 Carrying case. - A carrying case shall be provided with outside dimensions no larger than necessary to suitably contain all of the items and quantities described herein. The case shall be fabricated from aluminum or fiberglas (commercially available containers may be used). The case shall be suitably compartmented and designated to provide a safe means of securing all items during transit. Carrying handles shall be provided. All metal parts, except aluminum and stainless steel, shall be nickel or chrome plated.

3.17 Nameplate. - A nameplate shall be furnished in accordance with FAA-G-2100/1 and shall be mounted on the top of the case. The nameplate title shall be GLIDE SLOPE TEST KIT .

3.18 Markings. - Components requiring insertion phase calibration shall have the calibration data permanently marked thereon.

4. QUALITY ASSURANCE PROVISIONS

4.1 General. - See Section 1-4 of Specification FAA-G-2100/1 for classification of test and general methods of sampling and inspection.

4.2 Design qualification tests. - The design qualification test listed in the following tabulation shall be conducted under normal test conditions:

	RF Frequency	Paragraph
Power handling capability		
Variable attenuator	332 MHz	3.6
Phase shifter	332 MHz	3.6

4.3 Type tests. - Type tests are not required.

4.4 Production tests. - The tests listed in the following tabulation shall be conducted on each item under normal test conditions.

	RF Frequency	Paragraph
Variable attenuator		
dB calibration accuracy	332 MHz	3.8
Phase variation	332 MHz	3.8
Insertion phase	332 MHz	3.8
VSWR	328,332, 336 MHz	3.4, 3.8

Phase shifter			
Insertion phase at "0" setting		332 MHz	3.9
Adjustment range from "0"		332 MHz	3.9
VSWR	328, 332, 336 MHz		3.4, 3.9
RF Cable assemblies			
Insertion phase		332 MHz	3.11, 3.12 3.13
VSWR	328, 332, 336 MHz		3.4, 3.5 3.11, 3.12, 3.13
Wattmeter elements			
Calibration accuracy	328, 332, 336 MHz		3.10

5. PREPARATION FOR DELIVERY. - See FAA-R-1030.

6. NOTES. - None.

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